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Title: A Device for Applying viscous Adhesives onto rigid Surfaces.

Abstract

The invention deals with a device for a contour-accurate and excess-free application of viscous adhesive materials onto rigid surfaces. The device is comprised of a stamping device formed in the kind of a power-press and has a worktable for a defined positioning of the workpiece with an upwards directed surface to be adhesive coated. In the upper part of the stamping equipment, a stamper is provided, movable up and down, and fitted with a working surface corresponding to the surface area to be coated with the adhesive. The geometric shape of the working area corresponds to the negative of the surface profile of the workpiece to be adhesive coated, whereby this working area is fitted along the limiting borders of the adhesive coating area with a sealing rim formed as a continuous rim to be tightly placed onto the surface area of the workpiece to be adhesive coated. The working area facing the workpiece, is provided with open grooves arranged within the sealing rim. These grooves are connected with a feed-channel system, which is an integrated part of the stamping device beginning at a central supply location and extending in a uniformly branching manner in several branching levels like a tree.

Description

The invention deals with a device for applying viscous adhesive materials onto rigid surface areas as generically known from DE-OS 24 35 036, which forms the basis for the present invention.

The DE-OS 24 35 036 deals with a device for an areal and excess-free application of adhesives in the flowable state onto rigid surfaces. The device is comprised among others of a stamping device as a kind of power-press and of a worktable for positioning the workpiece with an upwards directed surface to be adhesive coated, whereby the stamping device and the worktable are axially movable relative to each other. In the upper part of the stamping device, a compressed air operated drive mechanism is provided for moving the stamper up and down. At its lower front surface, the stamper is fitted with a porous material, which has a surface profile at the side facing the workpiece corresponding to the negative of the surface profile of the workpiece to be adhesive coated. In the openings of the porous, areal working surface of the stamper facing the workpiece, the ready-to-use adhesive is located and is held by capillary forces against all gravitational forces depending on its rheological properties. However, an adhesive applied by this kind of device, will be non-uniformly distributed over the workpiece in regard to the geometry and quantity. Therefore, if adhesively bonding the workpiece to another part, undesirable lumps of adhesive may be formed at the edges of the combined parts, which have later to be removed. In some cases, if e.g. a part is to be adhesively bonded at the viewing side of a cover part having an inlay of expensive wood, the formation of the said lumps is entirely unacceptable. Furthermore, due to the irregular distribution of the adhesive, the surface area to be bonded is not completely covered by the adhesive, whereby the adhesive strength of the bond will be reduced.

In DE-OS 20 60 813, another device has been described for applying glue onto paper, whereby the glue via a glue feed-line is ejected out of the tips of needles to form a dot-like deposition of the glue on the paper. At an interruption of the process or at an exchange of the paper substrates, a vacuum (a backflow) is applied onto the glue present in the glue feed-line and, thereby, the excessive glue is suctioned off from the tips of the needles for avoiding a formation of droplets at the tips and a possible hardening of the residual glue. If this kind of an adhesive is applied onto a substrate for adhesively bonding a counter part, the adhesive will indeed be uniformly distributed in regard to geometry and quantity, but not in regard to a full areal coverage. A grid-system of deposited dots will rather be formed. However, in this case, undesirable lumps of adhesive may still be formed. Furthermore, the latent risk will always exist, that the full areal coverage of the surface by the adhesive will not be formed, whereby the adhesive bonding strength will again be reduced.

The DE-OS 31 15 818 deals with a tool for applying glue or other adhesives, respectively, onto profiled workpiece surfaces. The application device of the tool is provided with an application head, which is formed by several lamellas arranged on top of each other and fitted with an interior recess. The lamellas are arranged on a squared stud and mounted in a non-rotational but crosswise movable manner, whereby the stack of lamellas may be adapted to the particular profiled shape. In the profile adapted state of the stacked lamellas, these lamellas will be tensioned in the axial direction towards each other and will be fixed in their stationary position. Thereby, this side of the application head forms a negative of the respective surface profile to be bonded. The working area of the application head is provided with grooves extending in the direction of the smaller sides of the lamellas. These grooves are connected via a channel arranged in each lamella, to a hollow space formed between the said recess and the squared stud, which in turn is connected to a glue

feeding line. However, if a veneer is to be bonded onto this treated substrate, lumps of adhesive will also be formed, which have to be removed in additional processing steps.

The objectives to be achieved by the present invention deal with the development of a processing device, by which the adhesive coating can be applied over the desired entire surface area to be coated in an improved areal coverage and in a more uniform and more defined thickness without interruptions or excesses, whereby during the combination of the parts to be bonded, the adhesive will remain limited to the intended surface areas.

The objectives have been achieved according to the invention by a device exhibiting the characteristic criteria of the claim 1. Onto a workpiece placed in a defined position on a worktable of the device, a stamper is pressed with a force, which is greater than the later exerted feed pressure of the adhesive.

For assuring a dense but excess-free placing of the working area over the adhesive area of the workpiece even in the case of a strongly profiled or contoured workpiece, the geometric form of the working area of the stamper is formed as a negative of the adhesive area and is provided with an all around sealing border extending along the border line of the adhesive coating. (This surface area of the working area of the stamper surrounded and limited by the sealing border or -rim, shall be designated in the following as the adhesive coating area.) In this case, it is to be noted, that the adhesive coating area does not have necessarily to correspond to the later formed total adhesive area to be covered by the bonded counter part.

Within the sealing border or -rim, by which the adhesive may be accurately deposited according to the contours of the desired adhesive coating area, the working area of the stamper is provided with open grooves, which are connected to an adhesive feed system formed as an integral part of the stamper device, whereby this feed system originates from a central supply location and is branched like a tree forming several uniform levels of branching and distribution. Thereby, a uniform ejection of the adhesive into the grooves will be assured. The grooves are suitably arranged at a narrow spacing, whereby the adhesive will be very uniformly deposited over the entire area of the desired adhesive coating area. By a particular shaping of the grooves, the maximally possible dispensed volume of the adhesive to be deposited onto the workpiece, may be easily calculated. Then, during the subsequent bonding of the counter part, an areal cover of a uniformly thick, continuous and excess-free adhesive film is obtained at a respective shaping of the grooves and of the sealing border of the work area.

Furthermore, since the grooves and the feed system together with the supply tank form a closed system during the time of a pressed-on stamper, it is also possible to suction the adhesive back after a defined deposition onto the workpiece, whereby in contrast to the known state of the art, a well defined application of the adhesive is achieved. At the same time, an environmentally friendly and healthy application of the adhesive will be possible due to the fact, that almost no emission of solvent vapors will escape into the work area or the surroundings of the manufacturing plant.

Besides, the coating process /-equipment will be applicable for all possible types of adhesives, i.e. will be universally applicable.

In the following, the invention shall be further explained by describing an execution example as illustrated in the attached drawings.

Fig. 1 illustrates a cross-sectional view of a tool fitted with a device according to the invention.

Fig. 2 illustrates an enlarged section of fig. 1

Fig. 3 illustrates a view onto the workpiece-sided work area of the stamper.

The device illustrated in fig. 1, may be roughly sub-divided into 3 functional units, namely a stamping unit arranged in the upper part, an adhesive processing unit not shown in the drawings and a compression unit.

For the adhesive processing unit and for the conveying mechanism to the stamping unit, a commercially available equipment may be used, whereby only minor requirements are to be met in regard to a constant feed rate and -pressure. This kind of equipment may e.g. include drum melting units, crucible melt-adhesive dispensers or scraper-piston facilities.

The stamping device is comprised of a material cylinder (12), which is connected to the adhesive processing station (not shown) by means of a feedline (11), and by which the adhesive is dispensed by the up-and down movable and controllable material piston (13), whereby the adhesive is uniformly distributed from the central cylinder (12) through the tree-like branched channels (8) arranged in several levels of distribution in the direction towards the rigid work area (3) of the stamper (4).

The working area (3) of the stamper (4), which is adapted in its geometric shape to the negative of the surface profile of the workpiece (2), is provided along the border line (15) of its adhesive coating area (5) with a closed sealing dam in the form of a sealing strip (6) or a sealing edge (7) protruding in the direction of the workpiece (2) or, as the case may be, impinging into the surface of the workpiece (2), whereby the sealing strip (6) or the sealing edge, respectively, will form a sealing border for the adhesive coating on the workpiece (2). If the workpiece (2) is to be bonded with several counter parts, it is meaningful to provide the work area (3) with several adhesive coatings (5). This is particularly advantageous, since the individual counter parts may be easier positioned in a relative relation to each other and also in an accurately defined position to the workpiece (2).

Within the sealing edge (7) or the sealing strip (6), respectively, and the border lines (15), the working area (3) (of the stamper) is provided with a host (18) of crossing open grooves (9) facing the workpiece, which are arranged closely adjacent to each other and are connected to the feed-line system (8) characterized by the rigid walls. The individual grooves (9) are prepared in such a width, that the processed adhesive is held in place due to capillary forces under a consideration of its rheological properties and contrary to gravitational effects, whereby the spacing of the grooves (9) from each other preferably amounts to maximally 1.5-times of the width of the grooves.

Opposite to the working area (3) of the stamper (4), the work-table (1) is arranged, on which the workpiece (2) may be placed in a defined position.

Since the table (1) and the stamper (4) are accurately aligned to each other in a defined axial position, the adhesive may be accurately placed at the location -- which means the adhesive coating area (5) -- of the workpiece (2) where needed.

For depositing the adhesive onto the adhesive coating area (5), the workpiece (2) has to be at first placed onto the work-table (1) in a defined position and the stamper (4) is positioned against the workpiece (2). For assuring that the adhesive pressurized under pressure into the grooves (9) will remain in the adhesive coating area (5) as limited and defined by the sealing strips (6) or the sealing edges (7), respectively, and/or by the border line (15) and will not squeezed out at the sides of the sealing devices, the stamper (4) and the work-table (1) are arranged and placed between the pressure plates (14) of a power press, whereby the stamper (4) will be pressed against the workpiece (2) and the work-table (1) with a higher press-on pressure than exerted onto the adhesive feed-line.

For permitting a simple cleaning of the feed-line system (8) formed as an integral part of the stamper (4), it has been found advantageous to form the stamper (4) in a known manner in the shape of layers in the area levels of the branched feed-channels. Thereby, the stamper (4) may be disassembled into its individual, adjacent layers (10) and conveniently cleaned.

For processing melt-adhesives, it is meaningful to provide one or several layers (10) of the stamper (4) with a heating device (16) for assuring, that the melt-adhesive will always be in a low-friction and flowable state. The heat energies needed for this purpose may be reduced by the presence of an insulator plate (17) thermally insulating the stamper (4) from the upper pressure plate (14) of the power press.

PATENT CLAIMS

1. A device for a contour-accurate and excess-free application of viscous adhesive materials onto rigid surfaces of a workpiece comprised of a worktable for a defined positioning of the workpiece, whereby its surface to be adhesive coated is directed upwards, and comprised also of a stamping device formed in the kind of a power press with the following criteria:
   - In the upper part of the stamping device, a stamper is provided, movable up and down, with a respectively controllable drive mechanism,
   - the stamper is provided with a working area corresponding to the adhesive coating area of the rigid surface to be adhesively bonded,
   - the working area of the stamper has a permeable, areal-covering structure, in which openings are formed facing the workpiece arranged in an about uniform distribution over the working area, whereby the processed adhesive is held in place by capillary forces under a consideration of its rheological properties contrary to gravitational effects,
   - in the interior of the stamper, an adhesive feed-line system is formed originating from a central supply location and characterized by rigid walls and feeding into the workpiece-sided openings, and
   - an adhesive supply- and dosage device is directly connected to a central supply location of the feed-line system,

   wherein

   - the worktable (1) is fitted with a workpiece receptacle for a position-defined placing of the workpiece,
   - the geometric shape of at least the working area (3) of the stamper (4) is adapted to the negative of the surface profile of the adhesive coating area of the workpiece (2),
   - the structure of the working area (3) is formed by many crossing grooves, which are open in the direction towards the workpiece (2) and which are connected to the adhesive feedline system (8), whereby the grooves are spaced from each other corresponding maximally to 1.5-times the width of the grooves,
   - the working area (3) of the stamper (4) is fitted with a continuous sealing enclosure in the form of a sealing strip (6) or a sealing edge (7) protruding in the direction towards the workpiece (2) and extending along the limiting borderline (15) of the adhesive coating area (5), whereby these sealing devices form a sealing contact at the adhesive-coated surface of the workpiece, and
   - the adhesive feedline system (8) is prepared starting from the central supply location in a tree-like distribution and a uniformly branched manner in several levels of branching.

2. A device according to claim 1, **wherein** in the branched areas of the adhesive feedline system (8), the stamper (4) is structured in a known manner in the form of layers, whereby at all levels of branching of the adhesive feedline system (8), the adjacent layers (10) of the stamper (4) are removably placed together.

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1 Page with drawings is attached

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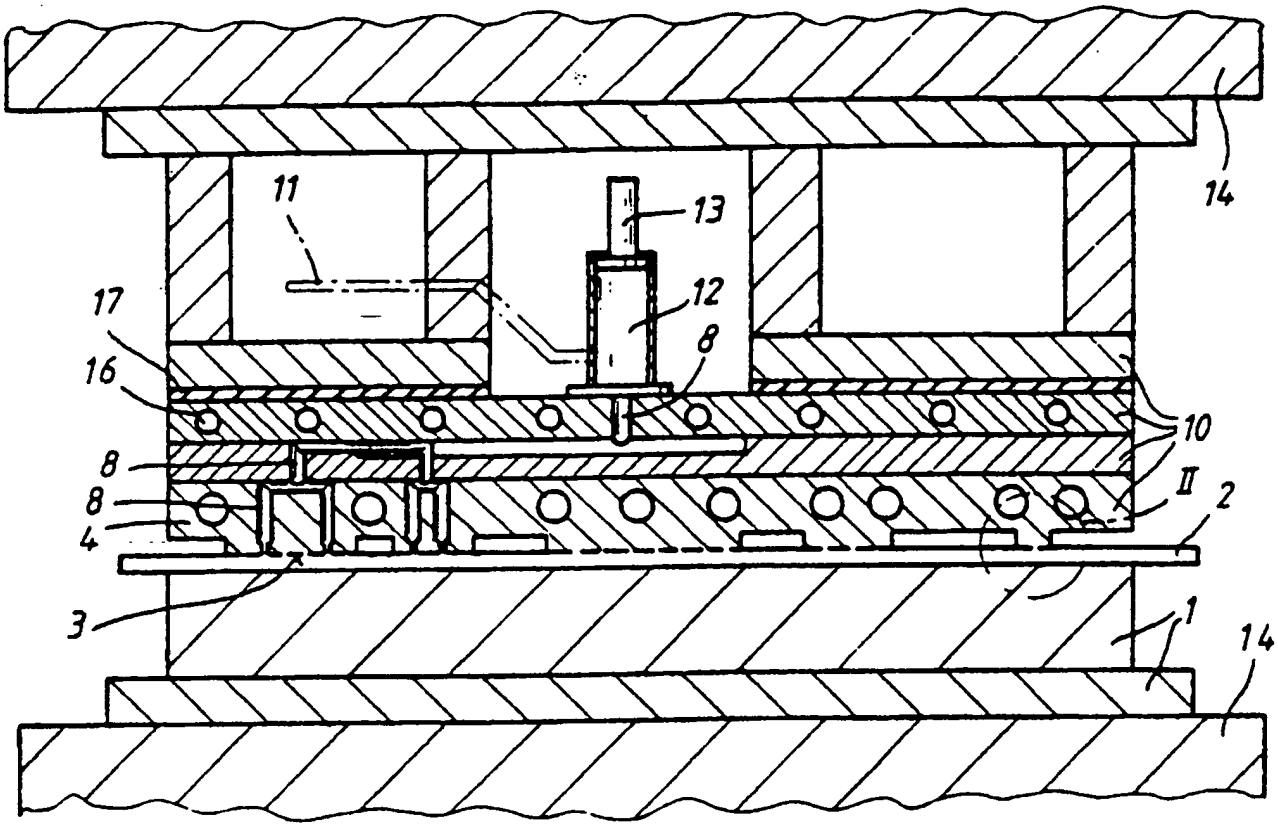

Fig.1

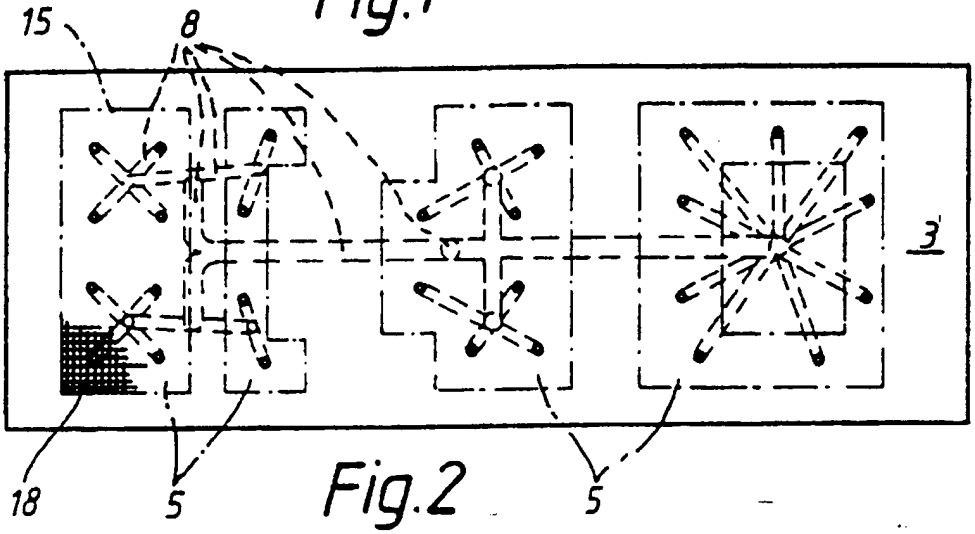

Fig.2

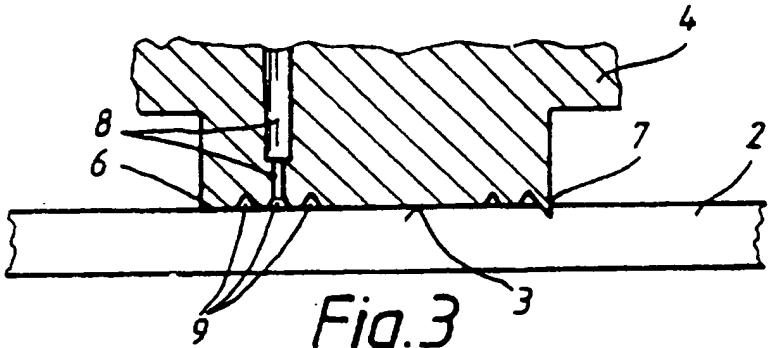

Fig.3

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